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MEMOIRS  
OF THE  
GEOLOGICAL SURVEY  
OF  
THE UNITED KINGDOM.

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Figures and Descriptions

ILLUSTRATIVE OF

BRITISH ORGANIC REMAINS.

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DECADE III.

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## NOTICE.

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PALÆONTOLOGICAL researches forming so essential a part of geological investigations, such as those now in progress by the Geological Survey of the United Kingdom, the accompanying plates and descriptions of British Fossils have been prepared as part of the Geological Memoirs. They constitute a needful portion of the publications of the Geological Survey, and are taken from specimens in the public collections, or lent to the Survey by those anxious to advance this branch of the public service.

The plan proposed to be followed in the work, of which this Decade forms a part, is as follows :—

To figure in elaborate detail, as completely as possible, a selection of fossils, illustrative of the genera and more remarkable species of all classes of animals and plants the remains of which are contained in British rocks ; to select especially such as require an amount of illustration which, to be carried out by private enterprise, would require a large outlay of money, with little prospect of a return, and a long time to accomplish, but which, by means of the staff and appliances necessarily employed on the Geological Survey, can be effected at small cost, and with a rapidity demanded by the publication of the Maps and Memoirs of the Survey ; thus, it is hoped, affording an aid to those engaged in the sciences with which this work is connected, that they might not otherwise have possessed, and which may materially promote the progress of individual research.

H. T. DE LA BECHE,

*Director-General.*

*Geological Survey Office, Jermyn Street,  
30th June, 1850.*

## B R I T I S H F O S S I L S.

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### DECADE THE THIRD.

THE third Decade of representations of British Fossils follows up the subject of the first, and continues the series of illustrations of the genera and species of extinct Echinodermata, especially those belonging to the orders *Asteriadæ* and *Echinidæ*.

The genera illustrated in this Decade are partly new, partly long-established; so also with the species, some of the most remarkable of unpublished forms having been selected, as well as some of the commonest and best known fossils. Yet, even respecting those which are so familiar that their whole history is believed to have been long ago made out, there is so much to be cleared up, so many points of structure hitherto very imperfectly or not at all elucidated, and such an accumulation of synonyms, that their investigation is much more laborious, and occupies much longer time, than inquiries into entirely new types. Thus, three of the fossils figured and described in this Decade, *Hemicidaris intermedia*, *Galerites albogalerus*, and *Micraster cor-anguinum*, are so familiar to geologists and naturalists, so abundant and so well preserved, that authors do not hesitate to cite them without comment, as if they were free from any obscurity. Nevertheless, I may say confidently, that not until now has the literature of these well-known and often-described forms been cleared up, and many of the most important points in their organization made known. Common as they are, no representations of them, presenting sufficient details of their structure, have ever appeared before.

Among the new forms now first described and figured, some are of singular interest. Two of them, the *Lepidaster Grayii* and the *Tropidaster pectinatus*, are not only new as species, but unquestionably possess features entitling them to become the types of new genera. Of those

belonging to old genera, the *Uraster Gaveyi* is singularly interesting, presenting, as it does, the spectacle of a Liassic echinoderm, which so closely resembles the commonest star-fish now living in the British seas, that it can only be distinguished from it by a minute and critical comparison ; and the *Hemicidaris Purbeckensis* is remarkable as being the first member of its tribe ever discovered in strata of the Purbeck series.

The species described and figured have been selected from formations of different geological epochs. From Silurian rocks *Lepidaster Grayii* has been taken ; from older secondary strata, the two forms of *Hemicidaris*, the *Galerites (Holoclytus) hemisphaerica*, chosen on account of its being new to Britain, and also affording an excellent illustration of the sub-genus to which it belongs, and the *Dysaster ringens*, selected for the same reasons ; also the new star-fishes, species of *Uraster* and *Tropidaster*, already alluded to. Of cretaceous fossils there are the critical *Galerites castaneus*, and the characteristic *Galerites albogalerus* and *Micraster cor-anguinum*.

A third series of illustrations of the fossil Echinoderms is far advanced, and in preparation for publication.

EDWARD FORBES.

June, 1850.

# BRITISH FOSSILS.

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## DECade III. PLATE IV.

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### HEMICIDARIS INTERMEDIA.

[Genus HEMICIDARIS. AGASSIZ. (Sub-kingdom Radiata. Class Echinodermata. Order Echinidae. Family Cidarites.) Body sub-globose; interambulacral segments very broad, bearing (few) primary perforated tubercles placed on crenated mammillary elevations; ambulacral areas very narrow, furnished with primary tubercles on their lower portions; pores in single file, except close to the mouth, where they are ranged in threes; summit crowned with a disk composed of five ovarian and five ocular plates surrounding a central anus; spines of two orders, the primaries long, cylindrical, mostly of considerable dimensions, the secondaries small, compressed.]

DIAGNOSIS. *H. testâ subglobosâ, areis ambulacralibus infra tuberculis majoribus confertis, interambulacralibus tuberculis approximatis; spinis subteretibus, cylindricis, longitudinaliter striatis, striis minutis, basi tumido.*

SYNONYMS. Variation of *Cidaris papillata*, PARKINSON, Organic Remains, vol. iii., p. 14, pl. 1, fig. 6; and pl. 4, fig. 20. *Cidaris intermedia*, FLEMING, Brit. Animals, p. 478 (1828). *Hemicidaris crenularis*, MORRIS, Cat. of Brit. Fossils, p. 53 (1843).—BUCKMAN and STRICKLAND's Edition of Murchison's Geology of Cheltenham, pl. 13 (1845).

The most common example of the genus *Hemicidaris* in British collections, is the species before us; the abundance and perfection of specimens rendering it a favourite fossil. It is usually regarded as the *Cidaris crenularis* of Lamarck, and is cited under that name in memoirs and works on English geology. For the following reasons, however, I feel obliged to reject the appellation of *crenularis* as applied to the English species, and to omit the usual citations and references to Lamarck and older authors, and to Goldfuss, Desmoulins, Agassiz, and Desor.

In the "Description des Echinodermes Fossiles de la Suisse," Agassiz has described at length and figured the *Hemicidaris crenularis* of Switzerland as the species of Lamarck and other authors. He has presented a specimen in remarkably perfect condition, its spines being entire. The figures are excellent, but the species, as the spines plainly show, is not the so-called *crenularis* of British geologists. As the bodies of the two species can only be critically distinguished from each other—unfortunately a frequent case in this genus—it is difficult to know to which the figures of Goldfuss, and the imperfect older repre-

sentations of Bourguet and Knorr should be referred. But the figure in Parkinson's "Organic Remains" (Pl. XLIII., fig. 6) of a "mammillated echinite from Wiltshire," unquestionably represents the species under consideration, though usually quoted as identical with the *crenularis* of Agassiz. The figure in Pl. IV., fig. 20, of the same work, representing a Wiltshire fossil with its spines, seems to me to belong to this species also, though it does not appear to have been cited as such except by Phillips in his "Geology of Yorkshire." In Dr. Fleming's "History of British Animals," the name *Cidaris intermedia* is applied to the former figure. Now as Lamarck expressly mentions that his *Cidaris crenularis* came from Switzerland, and as the *Hemicidaris crenularis* of Agassiz may fairly be regarded as that species, whilst it has been fully described and figured, and is certainly distinct from the British one, I propose to use Fleming's name of *intermedia* for the latter, and leave *crenularis* to that of Agassiz; thereby confusion will be avoided in future. Dr. Mantell has copied the figure of the Swiss species in his "Medals of Creation," vol. i. p. 340, remarking, however, that though usually identified with Parkinson's, he had never seen specimens in the English oolite like that figured by Agassiz.

*Hemicidaris crenularis* is sub-globose, varying from a depressed spheroid to a barrel-like shape. Its surface is elegantly studded with very prominent and large bosses bearing on their crenulated summits the perforate spiniferous tubercles. The ambulacral areas are very narrow at their summits, but gradually widen out in their course downwards, and immediately at the margin of the mouth are equal in diameter to the buccal ends of the interambulacral spaces. The latter are widest in their centres, and gradually narrow towards each end. Each interambulacral area is occupied by two rows of tubercles, each row including from six to eight, and as there is one of these tubercles on each interambulacral plate, the total number of plates in each area is from twelve to sixteen. Each plate is mainly occupied by the boss and its areola, the latter being quite smooth, and occupying less than half of the width of the former, which is also smooth, distinctly separated from the areola, very prominent, and depressed on its summit, where it is strongly crenulated around the base of the spheroidal deeply-perforated spiniferous tubercle. The tubercle is in diameter rather more than the breadth of the areola. The areolated spaces of the several plates are confluent; consequently on the upper and lower edges of the interambulacral plates there are no granules. But along the edges of both sides of each plate, there is a conspicuous row of small but well-marked perforated secondary tubercles, partially separated from each other by one or two granules. There are seven or eight of these on each edge of the larger plates. This produces the effect of a

sinuous elevated space ornamented with a double row of granules (secondary tubercles) running down the centre of each interambulacral area, and a similar single row separating the ambulacral area on each side from the poriferous avenues. The ambulacral areas bear very small spiniferous tubercles compared to those on the interambulacrals. On their upper and middle portion the tubercles are very small, but just below the largest interambulacral plate increase suddenly, then gradually diminish as they approach the mouth. There are about seven in a row (or fourteen in each ambulacral area) of the larger tubercles, of which, however, those nearest the mouth are as small as the ambulacral tubercles of the upper and middle portions of the area. Like the large primary bosses of the interambulacral plates, those of the ambulacrals also are crenulated at their summits below the perforated tubercles which crown them. The lower and larger ones are separated from each other by a few occasional granules, the upper ones are more distinctly bordered by minute granules. As there is only one spiniferous tubercle to each ambulacral plate, the effect of the ambulacral area is that of a widening space studded by closely-set tubercles, ranged in two rows, and suddenly increasing in size at the lower margin of the sides of the test. The avenues of pores are slightly sinuous ; the pairs of pores are ranged in single file as far as just below the sudden increase in the size of the ambulacral tubercles, when they become irregular and arranged in oblique rows of three pair in each. There are five or six of such rows extending to the mouth and causing the avenues to widen out considerably in the buccal region. There are nine or ten pair of pores opposite each of the larger plates.

The mouth is very wide, occupying three-fifths of the under-surface ; its margin is deeply notched and reflexed at the junction between each interambulacral series of plates and the poriferous avenues. There results a division of the mouth-margin into ten segments, five (those opposite the ambulacral spaces) wider than the other five.

The genital disk occupies a fourth of the diameter of the test. It is pentagonal, composed of five genital and five ocular plates. Three of the former are larger than the other two ; one of the three is the madreporiform plate. There is not so great a disparity in the dimensions of the ocular plates. The effect of this arrangement is to cause an eccentricity of the anal perforation. Both genital and ocular plates are irregularly studded with numerous small granules. The genital pores are placed in the lower portions of their plates. The eye-holes are very minute, marginal, and opposite the truncated ends of the ambulacral spaces.

The primary spines are long, tapering, and nearly cylindrical ; the larger ones grow to a length more than twice that of the diameter of

the body. They are minutely and closely striated throughout their length, but the *striæ* are rather broader than the raised interstices. The base of each spine has a narrow elevated fold surrounding it above its ring of crenulations, which are numerous, oblong, and closely and regularly set. The secondary spines (those surrounding the primaries on the interambulacral areas and entirely occupying the ambulacral spaces) are very small, compressed, rather spatulate and longitudinally striated. One of the largest measured two-tenths of an inch in length. I have seen traces of pedicellariæ, but not sufficiently perfect for description.

*Locality and Geological Position.*—This species is very abundant, and found in a beautiful state of preservation in the CORAL RAG of Calne. It is scarcer near Weymouth. It occurs also in the same stratum at Malton, and is recorded from the Coral Rag of Yorkshire by Professor Phillips. Mr. Buckman has figured a remarkably fine specimen from the neighbourhood of Cheltenham. In consequence of the doubts hanging over the identification of the British with the foreign *Hemicidaris crenularis*, I do not venture to give its foreign distribution.

#### EXPLANATION OF THE PLATE.

Fig. 1. Middle-sized specimen of the sub-depressed form of *Hemicidaris intermedia* seen in profile; an outline of the tall variety, from a specimen in the British Museum, is drawn around it.

Fig. 2. Dorsal surface; and Fig. 3, ventral surface of the same specimen.

Fig. 4. Ambulacral and interambulacral plates and their sculpture, taken from the centre of the sides.

Fig. 5. Ambulacral and interambulacral plates of the neighbourhood of the mouth.

Fig. 6. A single primary tubercle.

Fig. 7. Genital and ocular disk.

Fig. 8. Spines from a specimen presented to the Geological Survey by Mr. Clark of Sandgate.

Fig. 9. Base of a primary spine magnified.

Figs. 10 and 11. Small secondary spines.

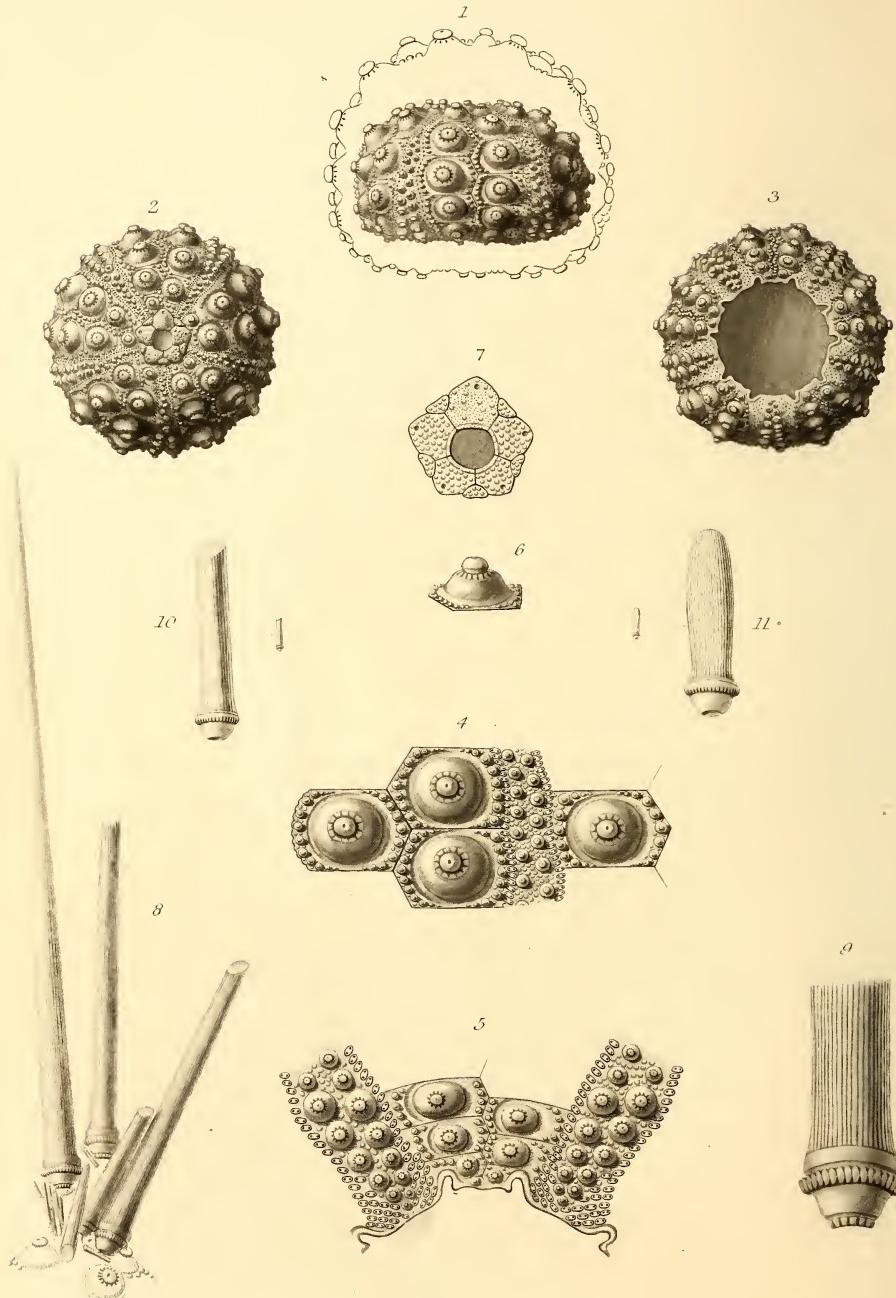
Figs. 4—7 and 9—11 are magnified.

EDWARD FORBES.

June, 1850.

## Geological Survey of the United Kingdom.

**HEMICIDARIS**  
(Oolitic)



HEMICIDARIS INTERMEDIA. *Fleming*